



# Digital Health Communication Strategies for Supporting Healthy Lifestyles in Adults with Noncommunicable Diseases and Limited Health Literacy: A Scoping Review

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## Abstract

**Background:** Digital health technologies are pivotal in delivering the WHO-recommended healthy lifestyle messages to reduce premature mortality associated with noncommunicable diseases (NCDs). However, evidence on effective strategies to promote healthy lifestyle behaviours among patients with limited health literacy remains insufficient. This review explores current digital health communication strategies that support healthy lifestyles in adults with NCDs and low health literacy.

**Methods:** A scoping review was conducted using Arksey and O'Malley's framework, focusing on adults with NCDs and limited health literacy, digital health communication strategies, and healthy lifestyle behaviours. Searches were performed across 14 electronic databases and bibliographies of relevant studies from Jan 2012 to Nov 2022. Only primary studies published in English were included. Findings were reported following the PRISMA Extension for Scoping Reviews guidelines.

**Results:** Overall, 12 studies involving 15,175 participants, predominantly from high-income countries, met the inclusion criteria. Five digital health communication strategies were identified: telecommunication-based coaching, mobile applications, text messaging programs, eHealth and web-based tools, and bundled or multimodal interventions. These strategies demonstrated positive impacts on supporting healthy lifestyle behaviours.

**Conclusion:** This review highlights the potential of diverse digital health communication strategies to enhance healthy lifestyle behaviours in adults with NCDs and limited health literacy. Tailoring these strategies to individual preferences is critical for optimizing outcomes. Further research is required to validate these findings, particularly in low- and middle-income countries.

**Keywords:** Digital health; Health literacy; Healthy lifestyle; mHealth; Noncommunicable diseases

## Introduction

Noncommunicable diseases (NCDs) account for 41 million deaths annually, representing 74% of all deaths globally (1). Cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes

are the leading causes, driven mainly by lifestyle factors such as tobacco use, physical inactivity, unhealthy diets, and alcohol consumption. These four groups of diseases account for over 80% of



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all premature NCD deaths, of which two-thirds of them are due to tobacco use, physical inactivity, harmful use of alcohol, and unhealthy diets (1-3). While not all NCDs are preventable, adopting a healthy lifestyle can lower the risk of severe illness and premature death by over 60% (1).

WHO has launched initiatives such as the Global Action Plan for Healthy Lives and Wellbeing for All (SDG3 GAP), emphasising increasing fruit and vegetable intake, reducing fat, sugar, and salt consumption, and promoting physical activity (1,4). Digital health technologies have become vital in disseminating these messages, especially in resource-limited settings (1,5,6).

Digital health encompasses a broad array of technologies, including mobile health (mHealth), telehealth, wearable devices, and health apps (7,8). This study uses the term 'digital health communication strategies' to describe these technologies collectively. As these strategies become more widespread, ensuring accessibility and usability for diverse populations is crucial (7). Digital health literacy, a specialized form of health literacy, is essential to make these strategies effective and usable for all (9). However, the current landscape of digital health literacy research is fragmented, lacking comprehensive insights into how digital health communication strategies support healthy lifestyles in adults with chronic diseases, particularly those with limited health literacy (7). A significant challenge researchers face is synthesising existing literature to understand the efficacy of various strategies across different contexts. Although much research has focused on these strategies in adults with adequate health literacy, there is a scarcity of data on their relevance and efficacy in those with limited health literacy, who are disproportionately affected by noncommunicable diseases. An innovative approach is needed to review and categorize existing literature, em-

phasizing the contextual nuances of digital health communication strategies in both resource-limited and resource-rich settings.

This scoping review aimed to bridge this gap by summarising existing literature on digital health communication strategies that support healthy lifestyles in adults with chronic conditions and limited health literacy. It also offers a foundation for future research to enhance the development of effective, contextually relevant digital health interventions.

## Methods

### *Review protocol and registration*

The researchers conducted this scoping review in accordance with Arksey and O'Malley's framework (10). The Open Science Framework registered the scoping review protocol (11). The report was structured according to the preferred reporting items for systematic reviews and meta-analyses extension for the scoping reviews checklist (12).

### *Eligibility criteria*

The researchers employed the Population, Intervention, and Outcomes (PIO) framework to refine this study's inclusion and exclusion criteria. The population consisted of adults with one or more noncommunicable diseases and at risk for limited health literacy, as identified by the authors or validated tests. The intervention focused on digital health communication strategies, targeting lifestyle behaviours (smoking, diet, alcohol, physical activity) and their impact on health literacy. Outcomes included promoting healthy behaviours, with sources from English studies published between Jan 2012 and Nov 2022 (Table 1).

**Table 1:** Scoping review inclusion and exclusion criteria

Element	Inclusion criteria	Exclusion criteria
Population	<ul style="list-style-type: none"> <li>An adult with one or multiple noncommunicable diseases</li> <li>At risk for limited health literacy by default as cited by the author(s), or found to have either limited, low, compromised, or inadequate health literacy by any validated health literacy test</li> </ul>	<ul style="list-style-type: none"> <li>Absence of health literacy assessment results</li> <li>Lack of citation of risk population with limited health literacy</li> </ul>
Intervention	<ul style="list-style-type: none"> <li>Digital health communication strategies support healthy lifestyles in adults with noncommunicable diseases who have possibly limited health literacy.</li> </ul>	
Outcomes	<ul style="list-style-type: none"> <li>Healthy lifestyle behaviours, including smoking cessation, healthy diet consumption, regular physical activity, and alcohol consumption cessation</li> </ul>	
Type of evidence sources	<ul style="list-style-type: none"> <li>Qualitative, quantitative, and mixed methods primary research published from January 2012 to November 2022</li> </ul>	<ul style="list-style-type: none"> <li>Grey literature, reviews, letters to the editor, opinions, and protocols</li> </ul>

### Information sources

Researchers and subject librarians from the University of the Free State (UFS) in South Africa and the University of Ulster in Northern Ireland jointly searched for sources of evidence. The team systematically searched 14 electronic databases, including PubMed, Web of Science, and 12 databases searched through EBSCOHost: Academic Search Ultimate, Africa-Wide Information, APA PsycArticles, APA PsycINFO, CINAHL with Full Text, Communication & Mass Media Complete, ERIC, Health Source – Consumer Edition, Health Source: Nursing/Academic Edition, Humanities Source Ultimate, MEDLINE, Sociology Source Ultimate. In addition, we conducted a general Google search for references of potentially eligible studies.

### Search strategy

The research team developed a comprehensive search strategy in collaboration with subject librarians. The team used Boolean operators for the search string. "Search: (((smartphone\* or smartphone\* or "cell phone\*" or "cellular phone\*" or "cellular telephone\*" or cellphone\* or "mobile device\*" or "personal digital assistant\*" or pda or "wireless device\*" or iphone\* or "text messag\*" or MMS or "multimedia messag\*

service" or SMS or "short messag\* service" or texting\* or texted or texter\* or handheld or hand-held or "mobile app\*" or e-technolog\* or "electronic health\*" or e-health\* or "wireless communication\*" or "mobile technol\*" or telemedicine or "mobile health" or mhealth or telehealth or telemonitor\* or "remind\* system\*" or "digital health" or "social media" or "digital storytelling" or "podcasting")) AND ((health\* and ("life style\*" or lifestyle\* or behavio\*)) or ("physical wellbeing" or "mental wellbeing" or "social wellbeing" or "physical wellbeing" or "mental wellbeing" or "social wellbeing")) AND (chronic\* or noncommunicable or "non communicable")) AND ("health litera\*"))

### Selection of sources of evidence

After deduplication, titles, abstracts, and full texts were screened against the inclusion and exclusion criteria independently by two researchers (KM & AM). Rayyan software facilitated the process (13). The full texts of potentially eligible studies were then screened for inclusion, with reasons for exclusion recorded. Any disagreements were resolved through discussion.

### Data charting process

Two researchers (KM and AM) collaboratively designed and tested a Google form for data ex-

traction to capture essential details from eligible studies. They independently extracted data, discussed discrepancies, and continuously refined the form through an iterative process.

### Data items

The data-charting Google form includes fields such as author(s), year of publication, study location, aim/purpose of the study, characteristics of study participants, sample size, details on interventions and providers, types of healthy lifestyle messages conveyed, frequency and duration of interventions, outcomes measured, tools used for measurement, and key findings.

### Synthesis of results

The team did not synthesise data akin to systematic reviews. Instead, they provided a narrative overview of reviewed studies, initially grouping data into tables and charts based on numerical digital health communication strategies analysis. These aided in identifying research gaps and areas of interest. Qualitative thematic analysis followed,

integrating Creswell's (14) and Tesch's (15) frameworks. Independent thematic analysis by KM & AM led to identified themes, resolved through consensus discussions. These discussions highlighted research gaps in the literature on digital health communication for adults with NCDs and potentially limited health literacy.

## Results

### Selection of sources of evidence

The team identified 663 records through database searching, and an additional 22 by bibliography searching of initially included studies after the search, bringing the total to 685. After deduplication, 437 records remained. These were title and abstract screened – this step excluded 375 records. The team thoroughly examined the remaining 60 records according to inclusion and exclusion criteria. Forty-eight records were excluded for reasons outlined in the PRISMA flow chart (Fig. 1), and 12 were included in this review.

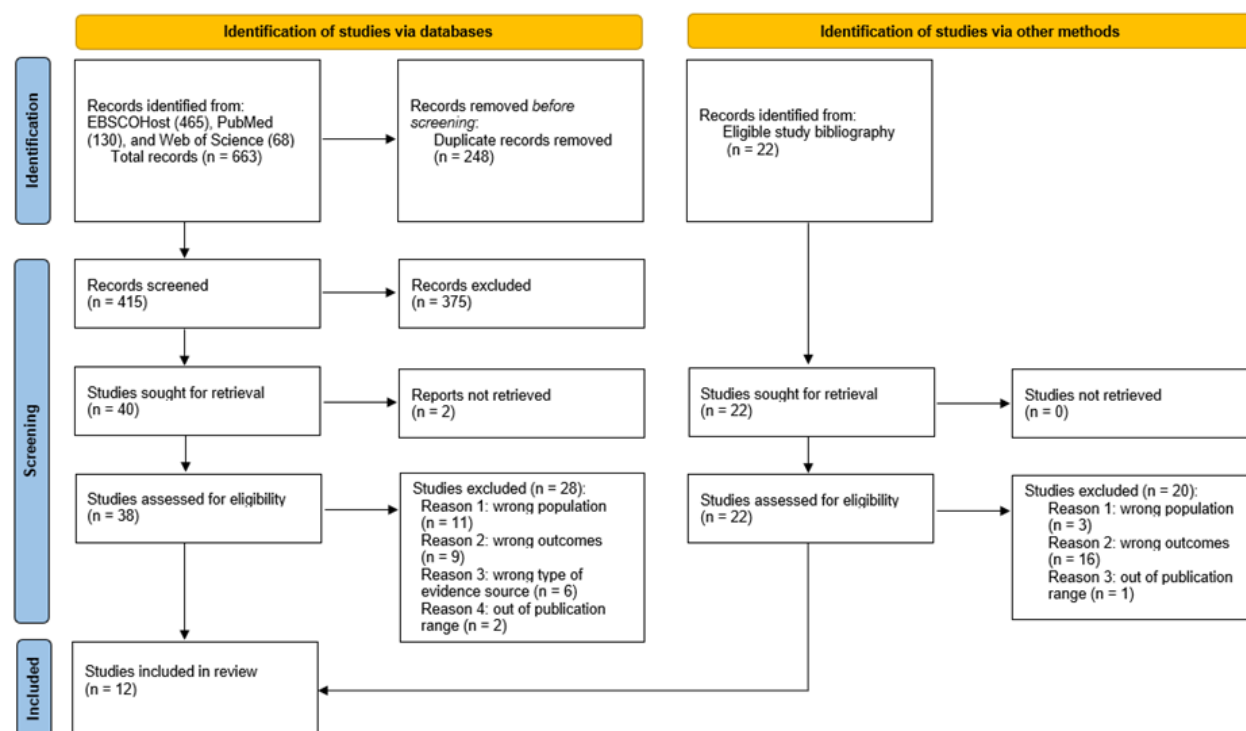


Fig. 1: PRISMA flow chart for study screening and selection

### Characteristics of the selected studies

Table 2 summarises the key characteristics of the 12 studies included in this review, involving 15,175 participants. Three-quarter of the included studies were published from 2018 and 2022 (16-23). They were predominantly conducted in high-income countries such as Germany (17,24,25), Sweden (18), the USA (20,23), Korea (21), Australia (22,26), Singapore (27), and Poland (16). Study designs varied among the included studies, half employing randomised controlled trials, fol-

lowed by surveys (25%). Participants often had specific chronic conditions like cardiovascular disease, hypertension, metabolic syndrome, and chronic obstructive pulmonary disease. Healthy lifestyle messages addressed smoking cessation, regular physical activity, alcohol consumption cessation, and healthy diet consumption. Message durations ranged from 2 to 12 months, with over half lasting more than six months. Frequency and duration varied across studies, with diverse measurement instruments utilised.

**Table 2:** Characteristics of included study (n=12)

Study [Country]	Interven- tion	Healthy lifestyle mes- sage communicated [Frequency & dura- tion]	Outcomes [Measurement tool]
17 [Germany]	Telephone- based health coaching	Smoking cessation;  Regular physical activity;  Alcohol consumption cessation  [Once every six weeks over a year]	Smoking cessation score [Questionnaire] Physical activity score in hours per week [Freiburg Questionnaire for Physical Activity] Alcohol consumption score [Al- cohol Use Disorders Identifica- tion Test] Health literacy score [Functional Communicative Critical Health Literacy]
24 [Germany]	Smartphon e and health app use	Smoking cessation;  Regular physical activity;  Healthy diet  [No frequency limit over a year]	Odds of smartphone/health app use for smoking cessation [Ad- justed Germany Aging Survey] Odds of smartphone/health apps use for physical activity [Adjusted Germany Aging Survey] Odds of smartphone/health app use for balanced diet consump- tion [Adjusted Germany Aging Survey] Odds of smartphone/health app use for low-fat diet consumption [Adjusted Germany Aging Sur- vey] Odds of smartphone/health app use for health literacy improve- ment [European Health Inter- view Survey]
18 [Sweden]	Use of an eHealth tool	Smoking cessation  [No frequency limit over 3 - 6 months post inter- vention]	Smoking cessation rate [Ques- tionnaire] Health literacy score [Communi- cative and Critical Health Literacy Scale, Swedish version]

Table 2: Continued...

19 [Uganda]	Bundled nurse-led intervention	Fruits and vegetable consumption;  Low-fat diet consumption;  Low-salt diet consumption  [Once a week over nine months]	Fruit and vegetable consumption rate [Self Care Hypertension Inventory]  Low-fat diet consumption rate [Self Care Hypertension Inventory]  Low-salt diet consumption rate [Self Care Hypertension Inventory]
20 [USA]	Text messaging	Healthy diet;  Regular physical activity  [Daily for six months, followed by participant's demand in the next six months over a year]	Odds of healthy diet consumption [Perceived Diabetes Self-Management Scale, 4-item version]  Odds of regular physical activity [Perceived Diabetes Self-Management Scale, 4-item version]  Optimal health literacy rate [Brief Health Literacy Screen]
21 [Korea]	Smartphone use	Smoking cessation;  Regular physical activity;  Alcohol consumption cessation  [No frequency limit, and duration not reported]	Smoking cessation prevalence [Questionnaire]  Regular physical activity prevalence [Questionnaire]  Alcohol consumption cessation prevalence [Questionnaire]  Health literacy score [Centers for Disease Control and Prevention's health literacy scale]
22 [Australia]	A consumer web-based app	Regular physical activity;  Smoking cessation  [No frequency limit over a year]	Meeting physical activity recommendations rate [Self-reported based on World Health Organization (WHO) Global Physical Activity Questionnaire]  Smoking cessation rate [Carbon monoxide meter]  High e-health literacy rate [eHealth literacy scale]
23 [USA]	Text message program	Healthy diet;  Smoking cessation;  Regular physical activity  [Once daily over six months]	Healthy diet consumption score [Diabetes Self-Care Activities questionnaire]  Smoking cessation score [Diabetes Self-Care Activities questionnaire]  Regular physical activity score [Global Physical Activity Questionnaire]
24 [Singapore]	Community-Based e-Health Program (CeHP)	Smoking cessation;  Regular physical activity;  Alcohol consumption	Current smoking prevalence [Self-care of Chronic Illness Inventory]  Regular physical activity prevalence [Self-care of Chronic Illness Inventory]  Regular alcohol consumption



Table 2: Continued...

		cessation [Only if blood pressure and glucose reading not entered or beyond the normal range over 8 weeks]	prevalence [Self-care of Chronic Illness Inventory] Health literacy score [Health Literacy Survey Short Form]
16 [Poland]	Internet use	Smoking cessation; Alcohol consumption; Regular physical activity; Fruit and vegetable consumption [Neither frequency nor duration reported]	Smoking cessation odds [Questionnaire] Alcohol consumption cessation odds [Questionnaire] Regular physical activity odds [Questionnaire] Fruits and vegetable consumption odds [Questionnaire] Health literacy odds [European Health Literacy Survey]
25 [Germany]	Telephone-based health coaching	Smoking cessation; Healthy diet; Regular physical activity; Alcohol consumption cessation  [Individually arranged over 6–12 months]	Smoking cessation score [Questionnaire] Healthy diet consumption score [Questionnaire] Regular physical activity score [Questionnaire] Alcohol consumption cessation score [Questionnaire]
26 [Australia]	Online material, email and telephone-based motivational interviewing	Fat consumption avoidance; Fibers consumption;  Fruits consumption; Regular physical activity  [Contacted at 1, 3, 6, 12, 18, and 24 weeks over 6 months]	Fat consumption avoidance score [Fat and Fibre Barometer] Fibers consumption score [Fat and Fibre Barometer] Fruits consumption score [Fat and Fibre Barometer] Regular physical activity score in min/week [International Physical Activity Questionnaire Short Form]

### **Methodological quality across individual selected studies**

Given the nature of the study, we chose not to conduct a methodological quality appraisal across studies, focusing instead on summarising the available evidence on the topic.

### **Key results from individual selected studies**

As shown in Table 3, among nine studies reporting smoking cessation outcomes, two observed increased quitting rates post-intervention (17,18). Four studies on healthy diet consumption found

positive results (19,23,24,26), including increased fruit/vegetable/fibre intake (19,26) and adoption of low-salt (19), low-fat (24), or balanced diets (23). Conversely, one study noted decreased fruit/vegetable consumption among daily internet users (16). Of nine studies reporting physical activity outcomes, five reported increased regular physical activity (21,22,24-25). For alcohol consumption, two studies found increased cessation rates (16,17). Health literacy improved in four studies (17,18,21,24) and declined in one (16) involving adults less frequently online.

**Table 3:** The key results from individual selected studies (n=12)

Study	Outcome measures				
	Smoking cessation	Healthy diet consumption (Balanced diet, fruits, vegetables, low fat, low salt)	Regular physical activity	Alcohol consumption cessation	Health literacy
17	Favoured intervention at 12 months (Mean difference = 0.01, 95%CI (0.00, 0.03), $P=0.03$ ) and 24 months (Means difference = 0.03, 95%CI (0.01, 0.04), $P=0.0001$ )	Not assessed	No difference at 12 months (Means difference = -0.27, 95%CI (-0.85, 0.31), $P=0.37$ ), 24 months (Means difference = -0.06, 95%CI (-0.67, 0.55), $P=0.85$ ) or at 36 months (Means difference = 0.07, 95%CI (-0.60, 0.73), $P=0.84$ )	Favoured control at 12 months (Means difference = -0.25, 95%CI (-0.34, -0.16), $P<0.0001$ ), 24 months (Means difference = -0.12, 95%CI (-0.22, -0.02), $P=0.02$ ), and 36 months (Means difference = -0.35, 95%CI (-0.45, -0.25), $P<0.0001$ )	Favoured intervention at 12 months (Means difference = 0.86, 95%CI (0.47, 1.24), $P<0.0001$ ), 24 months (Means difference = 0.92, 95%CI (0.51, 1.33), $P<0.0001$ ), and 36 months (Means difference = 0.89, 95%CI (0.44, 1.33), $P=0.0001$ )
24	No difference in smartphone users (OR= 1.11, 95%CI (0.9, 1.35), $P=0.35$ ) or in health apps users (OR=0.98, 95%CI (0.78, 1.22), $P=0.84$ )	No difference of balanced diet consumption in smartphone users (OR=1.03, 95%CI (0.85, 1.26), $P=0.75$ ) or health apps users (OR=1.06, 95%CI (0.84, 1.34), $P=0.63$ ) for  Favoured intervention on low-fat diet consumption in health apps users (OR=1.33, 95%CI (1.06, 1.66), $P=0.01$ )  Favoured control on low-fat diet consumption in smartphone users (OR=0.67, 95%CI (0.55, 0.81), $P<0.001$ )	Favoured intervention in smartphone users (OR=1.26, 95%CI (1.03, 1.52), $P=0.02$ ) and health apps users (OR=1.38, 95%CI (1.11, 1.72), $P=0.003$ )	Not assessed	Favoured intervention in smartphone users (OR= 1.05, 95%CI (1.04, 1.07), $P<0.001$ ) and health apps users (OR= 1.02, 95%CI (1.0, 1.03), $P=0.04$ )
18	Favoured intervention at 3 months (Intervention = 100% versus control = 70%)	Not assessed	Not assessed	Not assessed	Favoured intervention at 3 months (Median = 5 (5-1400)-Users versus 154 (5-2102)-control)
19	Not assessed	Favoured intervention at nine month on fruit and vegetables ( $P=0.043$ ), low-fat diet ( $P=0.016$ ), and low-salt diet ( $P=0.012$ ) consumption	Not assessed	Not assessed	Not assessed
20	Not assessed	Not assessed	Not assessed	Not assessed	No difference at 6-month (Response rate estimate = 0.000, 95%CI (-0.010, 0.009), $P>0.05$ ) or at 6-month post-intervention (Response rate estimate = 0.000, 95%CI (-0.010, 0.009), $P>0.05$ )



Table 3: Continued...

21	Favoured intervention (85.9%-intervention versus 79.6%-control, $P > 0.05$ )	Not assessed	Favoured intervention (70.5%-intervention versus 56.7%-control, $P < 0.05$ )	No difference (34.6%-intervention versus 42.7%-control, $P > 0.05$ )	Favoured intervention (Mean difference = 0.99, $P < 0.001$ )
22	No difference (RR=1.04, 95%CI (0.99,1.10), $P = 0.09$ )	Not assessed	Favoured intervention (RR=1.56, 95%CI (1.08,2.26), $P = 0.02$ )	Not assessed	No difference (Rate difference = 6.7, $P = 0.39$ )
23	Not reported	Favoured intervention at 6 months (Mean difference = $1.50 \pm 0.55$ , $P < 0.01$ )	No difference at 6 months (Mean difference = $1.00 \pm 0.58$ , $P = 0.09$ )	Not assessed	Not assessed
27	No difference (0%-Intervention versus 25%-Control, $p=0.71$ )	Not assessed	No difference at >3 times per week (Mean difference = 25%, $P = 0.71$ )	No difference (0%-Intervention versus 25%-Control, $P = 0.71$ )	No difference (Mean difference = -0.18, $P = 0.78$ )
16	No difference in all categories ( $P > 0.05$ )	Favoured control in fruit and vegetables consumption (OR= 0.64, 95%CI (0.42,0.99))	Favoured control (OR = 0.48, 95% CI (0.28–0.83))	Favoured control (OR = 1.65, 95%CI (1.09–2.50))	Favoured in control (OR = 0.71, 95%CI (0.52, 0.97), $P = 0.034$ )
25	No difference (6.1-intervention versus 8.3-control, $P=0.49$ )	No difference (19.5-intervention versus 27.1-control, $P=0.06$ )	Favoured control (Mean difference = -12.5, $P=0.03$ )	No difference (Mean difference = -4.0, $P=0.32$ )	Not assessed
26	Not assessed	Favoured intervention for fiber consumption (mean score difference = 1.6, $P < 0.001$ ), fat consumption avoidance (mean score difference=0.5, $P=0.016$ ), fruit intake (mean score difference=0.5, $P < 0.001$ ), and vegetable intake (mean score difference = 0.4, $P < 0.001$ )	Favoured intervention in walking (mean difference=181.5, $P=0.011$ ) and moderate (mean difference= 180, $P < 0.001$ ) but no difference in vigorous (mean difference= 36, $P= 0.07$ )	Not assessed	Not assessed

## Synthesis of results

### Digital health communication strategies

The results across the nine studies reported a favour of the intervention were synthesized into five thematic categories: telecommunication-based coaching, mobile technology and applications, text messaging programs, eHealth and web-based tools, and bundled and multimodal interventions. These themes represent various digital health communication strategies supporting healthy lifestyle in adults with chronic conditions and limited health literacy. Below are detailed findings for each category (Table 4).

### Telecommunication-Based Coaching

Telecommunication-based coaching utilizes remote communication technologies, such as telephone and video calls, to deliver personalized guidance and support to individuals. This ap-

proach was highlighted in three studies demonstrating its effectiveness in promoting healthy behaviors among adults with chronic conditions. Dwinger et al. (17) reported significant improvements in smoking and alcohol cessation through telephone-based health coaching for health-insured adults with chronic conditions. Tiede et al. (25) found that telephone coaching interventions effectively enhanced physical activity in patients with heart failure. Similarly, Blackford et al. (26) utilized mobile motivational interviewing to successfully promote healthy dietary habits among rural adults at risk of metabolic syndrome. These findings underscore the potential of telecommunication-based coaching in addressing diverse health challenges.

### Mobile Technology and Applications

Mobile technology and applications leverage devices such as smartphones and tablets to deliver personalized interventions, fostering patient empowerment in health management. This approach was demonstrated in three studies, showcasing the effectiveness of health apps, consumer web-based applications, and smartphone-integrated programs. Oh et al. (21) reported significant improvements in physical activity and smoking cessation among adults aged 60 and older using smartphones. Redfern et al. (22) highlighted in-

creased physical activity in patients with or at risk of cardiovascular disease through consumer web-based apps. Similarly, smartphones and health apps enhanced dietary habits and physical activity in adults aged 35 and older with chronic conditions (24). These findings emphasize the potential of mobile technologies in promoting healthier lifestyles.

**Table 4:** Digital health communication strategies support healthy lifestyle in adults with chronic diseases and limited health literacy (n = 9\*)

Strategy	Intervention	Positively impacted Healthy lifestyle behaviours	References
Telecommunication-based coaching	Telephone-based coaching	Smoking cessation	17
		Alcohol consumption cessation	
	Phone-based motivational interviewing	Regular physical activity	25
Mobile technology and applications	Smartphone use and health apps	Healthy diet consumption	26
	Consumer web-based apps	Regular physical activity	
	Smartphone-integrated programs	Regular physical activity	24
		Regular physical activity	22
Text messaging programs	Text message programs	Smoking cessation	21
eHealth and Web-based tools	eHealth tool	Regular physical activity	23
Bundled and multimodal interventions	Bundled nurse-led interventions	Healthy diet consumption	18
			19

\* The study reported a favour of interventions on supporting healthy lifestyle behaviours to participants

### Text Messaging Programs

Text messaging programs utilize SMS or text-based platforms to deliver reminders, educational content, and motivational prompts aimed at promoting healthier behaviors. Whittemore et al. (23) demonstrated the effectiveness of this approach, showing improved dietary habits among adults with type II diabetes who received targeted text message interventions. The program focused on individuals with HbA1c levels above 7.5%, highlighting the potential of text messaging as a practical tool for enhancing health outcomes in specific populations.

### eHealth and Web-Based Tools

eHealth and web-based tools provide healthcare services, education, and support through digital platforms such as online portals and interactive applications, facilitating patient engagement and promoting lifestyle changes. Marklund et al. (18) highlighted the effectiveness of eHealth self-management tools in increasing smoking cessation rates among individuals with Chronic Obstructive Pulmonary Disease (COPD), showcasing the potential of digital solutions in fostering healthier behaviors.

### ***Bundled and Multimodal Interventions***

Bundled and multimodal interventions integrate diverse strategies, including digital tools, educational programs, and personalized coaching, to offer comprehensive support tailored to patient needs. One study displayed a nurse-led intervention that combined telecommunication, web-based platforms, and mobile apps, effectively improving dietary habits among patients with hypertension (19).

## **Discussion**

Although digital health communication technologies have been shown to promote healthier lifestyles in the general population, their specific impact on adults with chronic diseases and limited health literacy remains unclear (28-30). This scoping review identified five key digital health communication strategies that support healthy lifestyle behaviours in this population: telecommunication-based coaching, mobile technology and applications, text messaging programs, eHealth and web-based tools, and bundled or multimodal interventions. However, these findings should be interpreted with caution, as most of the included studies were conducted in high-income countries, which may limit their generalizability to other settings.

Recent advancements in health communication technologies have led to the robust use of digital devices in healthcare services, including healthy lifestyle interventions (31, 32). Digital health communication technologies have shown promise in reducing health disparities for both communicable and noncommunicable diseases (31). These technologies, such as phone calls/texts/images, health apps, websites, internet portals, and social media, have effectively promoted healthy lifestyles across various chronic conditions (31, 33). Despite debates on their efficacy, this review demonstrates that adults with noncommunicable diseases and limited health literacy benefit from digital health communication technologies, especially in high-income countries over one year.

Despite encouraging results from recent studies on digital health communication strategies for adults with chronic diseases (34, 35), there remains controversy regarding their effectiveness across different conditions (36). A patient's condition, preferences, and cultural background are critical for successful lifestyle modifications (37, 38). For example, U.S. adults with chronic conditions were more likely to use mobile health apps (39). Positive links between digital health technologies and health behaviours have been reported, like increased physical activity via smartphone apps (40). This review identified a range of digital health communication strategies across various chronic diseases, highlighting the importance of tailoring interventions to individual preferences to achieve better clinical outcomes (34,41,42).

### ***Strengths and Limitations***

This review has several strengths: it followed a predefined protocol, utilized diverse evidence sources, and employed a systematic, transparent approach with multiple reviewers at each stage. Rayyan software facilitated screening, and findings were reported per PRISMA-ScR guidelines. However, limitations include excluding grey literature, reviews, protocols, and articles without full text, which may have omitted relevant data. Additionally, most included studies were conducted in high-income countries, with follow-up periods generally not exceeding one year.

## **Conclusion**

Variety digital health communication strategies can effectively improve lifestyle behaviours among adults with chronic diseases and limited health literacy. Five key strategies were identified: telecommunication-based coaching, mobile technology and applications, text messaging programs, eHealth and web-based tools, and bundled or multimodal interventions. Tailoring these approaches to individual preferences is essential for optimizing clinical outcomes. However, these findings should be interpreted with caution, as most of the included studies were conducted in

high-income countries, which may limit their generalizability to other settings. Future research should validate these findings in low- and middle-income countries to enhance their global applicability and effectiveness.

## Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## Conflict of interest

The authors declare that there is no conflict of interests.

## References

- World Health Organisation (2022). Noncommunicable diseases. Available: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases> Accessed: 15/01/2023.
- Haileamlak A (2019). Physical Inactivity: The Major Risk Factor for Noncommunicable Diseases. *Ethiop J Health Sci*, 29(1):810.
- Phillips EM, Frates EP, Park DJ (2020). Lifestyle Medicine. *Phys Med Rehabil Clin N Am*, 31(4): 515-526.
- World Health Organisation (2019). Global Action Plan for Healthy Lives and Wellbeing for All (SDG3 GAP). Available: <https://www.who.int/initiatives/sdg3-global-action-plan> Accessed: 15/01/2023.
- Jandoo T (2020). WHO guidance for digital health: What it means for researchers. *Digital Health*, 6:2055207619898984.
- Madanian S, Nakarada-Kordic I, Reay S, et al (2023). Patients' perspectives on digital health tools. *PEC Innov*, 2:100171.
- Smith B, Magnani JW (2019). New technologies, new disparities: The intersection of electronic health and digital health literacy. *Int J Cardiol*, 292: 280-2.
- Shuren J, Patel B, Gottlieb S (2018). FDA Regulation of Mobile Medical Apps. *JAMA*, 320(4): 337-8.
- van Kessel R, Wong BLH, Clemens T, et al (2022). Digital health literacy as a super determinant of health: More than simply the sum of its parts. *Internet Interv*, 27: 100500.
- Arksey H, O'Malley L (2005) Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1): 19-32.
- Malale K, Reid M, Moorhead A (2022). Digital health communication strategies to support a healthy lifestyle in adults with chronic diseases who have possible limited health literacy: a scoping review.
- Tricco AC, Lillie E, Zarin W, et al (2018). PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and explanation. *Ann Intern Med*, 169(7): 467-73.
- Ouzzani M, Hammady H, Fedorowicz Z, et al (2016). Rayyan—a web and mobile app for systematic reviews. *Syst Rev*, 5(1): 210.
- Creswell JW (2009). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Tesch R (1990). Qualitative research: Analysis types and software tools. Falmer, New York.
- Duplaga M (2021). The association between Internet use and health-related outcomes in older adults and the elderly: a cross-sectional study. *BMC Med Inform Decis Mak*, 21(1): 150.
- Dwinger S, Rezvani F, Kriston L, et al (2020). Effects of telephone-based health coaching on patient-reported outcomes and health behaviours change: A randomised controlled trial. *PLoS One*, 15(9): e0236861.
- Marklund S, Tistad M, Lundell S, Östrand L, et al (2021). Experiences and Factors Affecting Usage of an eHealth Tool for Self-

- Management Among People With Chronic Obstructive Pulmonary Disease: Qualitative Study. *J Med Internet Res*, 23(4): e25672.
19. Nanyonga RC, Spies L A, Nakaggwa F (2022). The effectiveness of nurse-led group interventions on hypertension lifestyle management: A mixed method study. *J Nurs Scholarsh*, 54(3):286-295.
20. Nelson LA, Spieker A, Greevy R, et al (2020). User Engagement Among Diverse Adults in a 12-Month Text Message-Delivered Diabetes Support Intervention: Results from a Randomized Controlled Trial. *JMIR MHealth UHealth*, 8(7): e17534.
21. Oh YS, Choi EY, Kim YS (2018). Predictors of Smartphone Uses for Health Information Seeking in the Korean Elderly. *Soc Work Public Health*, 33(1): 43-54.
22. Redfern J, Coorey G, Mulley J, et al (2020). A digital health intervention for cardiovascular disease management in primary care (CONNECT) randomised controlled trial. *NPJ Digit Med*, 3: 117.
23. Whittemore R, Vilar-Compte M, Cerda S, et al (2020). ¡Sí, Oo Puedo Vivir Sano con Diabetes! A self-management randomised controlled pilot trial for low-income adults with type 2 diabetes in Mexico City. *Curr Dev Nutr*, 4(5): nzaa074.
24. Ernstring C, Dombrowski SU, Oedekoven M, et al (2017). Using Smartphones and Health Apps to Change and Manage Health Behaviours: A Population-Based Survey. *J Med Internet Res*, 19(4): e101.
25. Tiede M, Dwinger S, Herbarth L, Härter M, et al (2017). Long-term effectiveness of telephone-based health coaching for heart failure patients: A post-only randomised controlled trial. *J Telemed Telecare*, 23(8): 716-724.
26. Blackford K, Jancey J, Lee AH, et al (2016). Effects of a home-based intervention on diet and physical activity behaviours for rural adults with or at risk of metabolic syndrome: a randomised controlled trial. *Int J Behav Nutr Phys Act*, 13: 13.
27. Wu VX, Dong Y, Tan PC, Gan P, et al (2022). Development of a Community-Based e-Health Program for Older Adults With Chronic Diseases: Pilot Pre-Post Study. *JMIR Aging*, 5(1): e33118.
28. Malale K, Fu J, Nelson W, Gemuhay HM, Gan X, Mei Z (2020). Potential Benefits of Multimedia-Based Home Catheter Management Education in Patients With Peripherally Inserted Central Catheters: Systematic Review. *J Med Internet Res*, 22(12): e17899.
29. Minutolo A, Damiano E, De Pietro G, et al (2022). A conversational agent for querying Italian Patient Information Leaflets and improving health literacy. *Comput Biol Med*, 141:105004.
30. Geboers B, Reijneveld SA, Jansen CJM, et al (2016). Health Literacy Is Associated With Health Behaviourss and Social Factors Among Older Adults: Results from the LifeLines Cohort Study. *J Health Commun*, 21(sup2): 45-53.
31. Schoenberger YM, Phillips J, Mohiuddin MO, et al (2013). Acceptability of Delivering and Accessing Health Information Through Text Messaging Among Community Health Advisors. *JMIR Mhealth Uhealth*, 1(2): e22.
32. Senbekov M, Saliev T, Bukeyeva Z, et al (2020). The Recent Progress and Applications of Digital Technologies in Healthcare: A Review. *Int J Telemed Appl*, 2020: 8830200.
33. Kim SJ, Marsch LA, Brunette MF et al (2017). Harnessing Facebook for Smoking Reduction and Cessation Interventions: Facebook User Engagement and Social Support Predict Smoking Reduction. *J Med Internet Res*, 19(5): e168.
34. Madrigal L, Escoffery C (2019). Electronic Health Behaviourss Among US Adults With Chronic Disease: Cross-Sectional Survey. *J Med Internet Res*, 21(3): e11240.
35. Samal L, Fu HN, Camara DS, et al (2021). Health information technology to improve care for people with multiple chronic conditions. *Health Serv Res*, 56 Suppl 1(Suppl 1):1006-1036.
36. Allman-Farinelli M, Chen J (2017). mHealth technologies in the management of obesity: a narrative review. *Smart Homecare Technology and TeleHealth*, 2017: 53-59.
37. Strickland JR, Smock N, Casey C, et al (2015). Development of targeted messages to promote smoking cessation among construction trade workers. *Health Educ Res*, 30(1): 107-120.



38. Ye R, Wu Y, Sun C, et al (2022). Health Communication Patterns and Adherence to a Micronutrient Home Fortification Program in Rural China. *J Nutr Educ Behav*, 54(1): 36-45.
39. Bhuyan SS, Lu N, Chandak A, et al (2016). Use of Mobile Health Applications for Health-Seeking Behaviours Among US Adults. *J Med Syst*, 40(6): 153.
40. Stephens J, Allen J (2013). Mobile phone interventions to increase physical activity and reduce weight: a systematic review. *J Cardiovasc Nurs*, 28(4): 320-329.
41. Jin Q, Boyce TW, Kang H, et al (2021). Acceptability of Phone Calls and Texts to Promote Healthy Behaviourss Among Spanish-Speaking Hispanics. *Hispanic Journal of Behavioural Sciences*, 43(3): 073998632110349.
42. Stefanicka-Wojtas, D., & Kurpas, D. (2022). eHealth and mHealth in Chronic Diseases- Identification of Barriers, Existing Solutions, and Promoters Based on a Survey of EU Stakeholders Involved in Regions4PerMed (H2020). *J Pers Med*, 12(3):467.